WATER QUALITY MEMORANDUM

Utah Coal Regulatory Program

OK

January 25, 2008

TO: Internal File

THRU: Pamela Grubaugh-Littig, Permit Supervisor pgl

FROM: Dana Dean, P.E., Senior Reclamation Hydrologist

RE: 2006 Fourth Quarter Water Monitoring, Canyon Fuel Company, LLC, Skyline Mine, C/007/0005-WQ-06-4, Task #2639

The Skyline Mine is an operating longwall mine. Current operations are in the North Lease area of the mine. Many mined-out areas of the mine have been sealed-off. Water monitoring requirements can be found in Section 2, especially pages 2-36, 2-36a, 2-36b, 2-37, 2-37a, and 2-39aa of the MRP.

There are 42 stream sampling sites in the North Lease where the Permittee will measure flow on a monthly basis for 12 months prior to, during and 12 months after longwall mining below each site. The Division will check this monitoring in conjunction with the Annual Report.

1. Was data submitted for all of the MRP required sites? YES ☒ NO ☐

Springs

The MRP requires fourth quarter sampling at 25 springs (S10-1, S12-1, S13-2, S13-7, S14-4, S15-3, S17-2, S22-5, S22-11, S23-4, S24-1, S24-12, S26-13, S34-12, S35-8, S36-12, 2-413, 3-290, 8-253, WQ1-39, WQ3-6, WQ3-26, WQ3-41, WQ3-43, and WQ4-12).

The Permittee submitted all required samples for the spring sites.

Streams

The MRP requires fourth quarter sampling at 36 stream-sites (CS-3, CS-4, CS-6, CS-7, CS-8, CS-9, CS-10, CS-11, CS-12, CS-13, CS-14, CS-16, CS-17, CS-18, CS-19, CS-20, CS-21, CS-22, CS-23, MD-1, SRD-1, F-9, F-10, UP&L-10, VC-6, VC-9, VC-10, VC-11, VC-12, WRDS-1, WRDS-2, WRDS-3, WRDS-4, EL-1, and EL-2).

The Permittee submitted all required samples for the stream sites.

Wells

The MRP requires fourth quarter sampling at 18 wells (JC-1, JC-3, ELD-1, W79-10-1-B, W79-14-2A, W79-26-1, W79-35-1A, W79-35-1B, W2-1, W20-4-1, W20-4-2, W99-4-1, W99-21-1, W99-28-1, W20-28-1, 91-26-1, W91-35-1, and 92-91-03).

The Permittee submitted all required samples for the well sites.

UPDES

*The UPDES Permit/MRP require **weekly** monitoring of 3 outfalls: 001, Sedimentation Pond Discharge to Eccles Creek at the Portal; 002, Sedimentation Pond Discharge to Eccles Creek at the Loadout; and 003, the Sedimentation Discharge at the Waste Rock Disposal Site. Well JC-3 is permitted as a UPDES point, but PacifiCorp is the Permittee, and JC-3 has not discharged since July of 2004.*

The Permittee submitted all required samples for the UPDES sites. Only outfall 001 reported flow.

2. Were all required parameters reported for each site? YES ☐ NO ☒

Tritium was not reported at EL-1, EL-2, S15-3, S24-1, 2-413, JC-1 or 8-253. JC-1 is also missing Oxygen 18, Carbon 14, and Deuterium. The laboratory that provides the age dating data quite often takes a long time to report the data back to the Permittee. The Permittee has always been quite prompt at getting the data to the Division as soon as they receive it from the lab.

There was not enough flow at spring S10-1 to get a "clean" sample, no lab parameters were tested.

3. Were any irregularities found in the data? YES ☒ NO ☐

Several parameters fell outside of two standard deviations from the mean encountered at the respective sites. They were:

Site	Parameter	Value	Standard Deviations from Mean	Mean
CS-3	Cation/Anion Balance	3.4%	2.19	1.19%
CS-3	Dissolved Calcium	98.9 mg/L	2.22	75.49
CS-3	Specific Conductivity	689 µmhos/cm	2.64	453.31 µmhos/cm
CS-3	Chloride	64 mg/L	3.00	14.61 mg/L
CS-20	Cation/Anion Balance	4.6 %	2.62	1.26 %
CS-20	Specific Conductivity	480 µmhos/cm	2.73	351.55 µmhos/cm
CS-21	Specific Conductivity	493 µmhos/cm	2.38	385.25 µmhos/cm
F-10	Cation/Anion Balance	4.4 %	2.45	0.94 %

F-10	Specific Conductivity	455 µmhos/cm	2.36	382.23 µmhos/cm
UPL-10	Nitrate + Nitrite	0.39 mg/L	2.47	0.17 mg/L
WQ3-6	Specific Conductivity	626 µmhos/cm	2.71	523.17 µmhos/cm
WQ3-6	Chloride	5 mg/L	2.01	3.92 mg/L
WQ3-26	Chloride	3 mg/L	2.13	1.91 mg/L
WQ4-12	Total Suspended Solids	86 mg/L	2.32	34.30 mg/L

The cation/anion balance at CS-3, CS-20, and F-10 is not of concern, since it is within the expected range (<5%) at each site.

There is a weak upward trend in chloride at WQ3-6 ($R^2 = 0.3401$), and no trend at WQ3-26. At each spring, there are only 15 samples in the population. At WQ3-6 eleven are 4 mg/L, one is 3 mg/L, and three are 5mg/L. At WQ3-26, one is a non-detect, one is 1mg/L, twelve are 2mg/L, and this one is 3 mg/L. These levels are well below any water quality standards, and are not of concern. There is a fairly strong upward trend in chloride at CS-3 ($R^2 = 0.6664$), but levels are well below the drinking water criterion of 250 mg/L, and the criteria for protection of aquatic life of 600 mg/L.

There is no trend in dissolved calcium at CS-3 ($R^2 = 0.0029$), and levels are well below any quality standards.

There is no trend in nitrate+nitrite at UPL-10 ($R^2 = 0.0745$). The combined nitrate/nitrate level is below the recommended limit of 10 mg/L.

There is a weak upward trend in the specific conductivity at CS-3 ($R^2= 0.2965$), a very weak upward trend in the specific conductivity at CS-21 ($R^2= 0.1886$), and no trend at F-10, CS-20, or WQ3-6 ($R^2= 0.0809$, 0.0365, and 0.0023). There is no standard for specific conductivity, but it is closely related to total dissolved solids (TDS). The TDS at each of these sites is within the expected range.

There is a weak upward trend in the TSS at WQ4-12 ($R^2 = 0.3408$). Total suspended solids readings at springs can be influenced by many factors, and this quarter's concentration is 78 mg/L less than last quarter's.

Several routine Reliability Checks were outside of standard values. They were:

Site	Reliability Check	Value Should Be...	Value is...
CS-3	TDS/Conductivity	>0.55 & <0.75	0.54
CS-3	Na/(Na + Cl)	> 50%	20%
CS-4	Conductivity/Cations	>90 & < 110	90
CS-4	Na/(Na + Cl)	> 50%	47%
CS-6	Conductivity/Cations	>90 & < 110	82
CS-6	Mg/(Ca + Mg)	< 40 %	51%
CS-9	Conductivity/Cations	>90 & < 110	87
CS-11	Conductivity/Cations	>90 & < 110	87

CS-11	Na/(Na + Cl)	> 50%	45%
CS-12	TDS/Conductivity	>0.55 & <0.75	0.77
CS-12	Conductivity/Cations	>90 & < 110	78
CS-12	Mg/(Ca + Mg)	< 40 %	52%
CS-12	Ca/ (Ca + SO4)	> 50 %	35%
CS-13	TDS/Conductivity	>0.55 & <0.75	0.81
CS-13	Conductivity/Cations	>90 & < 110	70
CS-13	Na/(Na + Cl)	> 50%	47%
CS-14	Conductivity/Cations	>90 & < 110	83
CS-14	Mg/(Ca + Mg)	< 40 %	46%
CS-19	Conductivity/Cations	>90 & < 110	81
CS-21	Conductivity/Cations	>90 & < 110	90
F-10 Nov 7	Conductivity/Cations	>90 & < 110	88
UPL-10	Na/(Na + Cl)	> 50%	39%
VC-6	Conductivity/Cations	>90 & < 110	81
VC-6	Mg/(Ca + Mg)	< 40 %	50%
VC-6	Ca/ (Ca + SO4)	> 50 %	47%
VC-9	Conductivity/Cations	>90 & < 110	84
VC-9	Mg/(Ca + Mg)	< 40 %	52%
VC-9	Ca/ (Ca + SO4)	> 50 %	45%
S13-7	Conductivity/Cations	>90 & < 110	84
S17-2	Conductivity/Cations	>90 & < 110	84
S17-2	Na/(Na + Cl)	> 50%	45%
WQ1-39	Conductivity/Cations	>90 & < 110	89
WQ3-6	TDS/Conductivity	>0.55 & <0.75	0.55
WQ3-26	Cation/Anion Balance	< 5%	7.7%
WQ3-26	Conductivity/Cations	>90 & < 110	116
WQ3-41	Conductivity/Cations	>90 & < 110	87
WQ3-43	Conductivity/Cations	>90 & < 110	88
WQ4-12	K/(Na + K)	< 20%	21%
92-91-03	TDS/Conductivity	>0.55 & <0.75	0.80
92-91-03	Conductivity/Cations	>90 & < 110	74

These inconsistencies do not necessarily mean that a sample is wrong, but it does indicate that something is unusual. An analysis and explanation of the inconsistencies by the Permittee would help to increase the Division's confidence in the samples. The Permittee should work with the lab to make sure that samples pass all quality checks so that the reliability of the samples does not come into question. The Permittee can learn more about these reliability checks and some of the geological and other factors that could influence them by reading Chapter 4 of *Water Quality Data: Analysis and Interpretation* by Arthur W. Hounslow. A geological influence is most likely here, since most samples have the same inconsistencies, and they recur each quarter.

The Utah Division of Water Quality (DWQ) issued the current UPDES permit on Nov. 23, 2004. It allows for a daily maximum of total dissolved solids discharged (TDS) of

1310 mg/l and a 30-day average of 500 mg/l. There is no tons per day (tpd) daily maximum, unless the 30-day average exceeds 500 mg/l; then a 7.1-tpd limit is imposed. The permit also states:

Upon determination by the Executive Secretary that the permittee is not able to meet the 500 mg/L 30-day average or the 7.1 tons per day loading limit, the permittee is required to participate in and/or fund a salinity offset project to include TDS offset credits, within six (6) months of the effective date of this permit.

The Division of Water Quality approved a Salinity Offset Plan for the Skyline Mine on January 5, 2005. A copy of the agreement can be found in the Division's Incoming files, and at:

https://fs.ogm.utah.gov/FILES/COAL/PERMITS/007/C0070005/2005/INCOMING/0006.pdf.

For the fourth quarter of 2006, the Permittee has not exceeded the daily max of 1310 mg/L for TDS. However, at Outfall 001 the 30-day average has remained above 500 mg/l and the tons per day are much greater than 7.1. Because of these exceedences, Canyon Fuel Company continues to participate in the salinity-offset program.

4. On what date does the MRP require a five-year re-sampling of baseline water data.

There is no commitment in the MRP to resample for baseline parameters. However, they are required to monitor 8 stream sites (CS-1, CS-7, CS-8, CS-10, CS-16, CS-17, CS-18, and VC-10) and 13 springs (S13-2, S14-4, S15-3, S22-5, S22-11, S23-4, S24-12, S26-13, S34-12, S35-8, S36-12, 2-413, and 3-290) for all operational parameters at high and low flow (where accessible) once every five years (2010, 2015, etc.), and whenever abrupt changes in flow occur.

5. Based on your review, what further actions, if any, do you recommend?

No further actions are necessary at this time.

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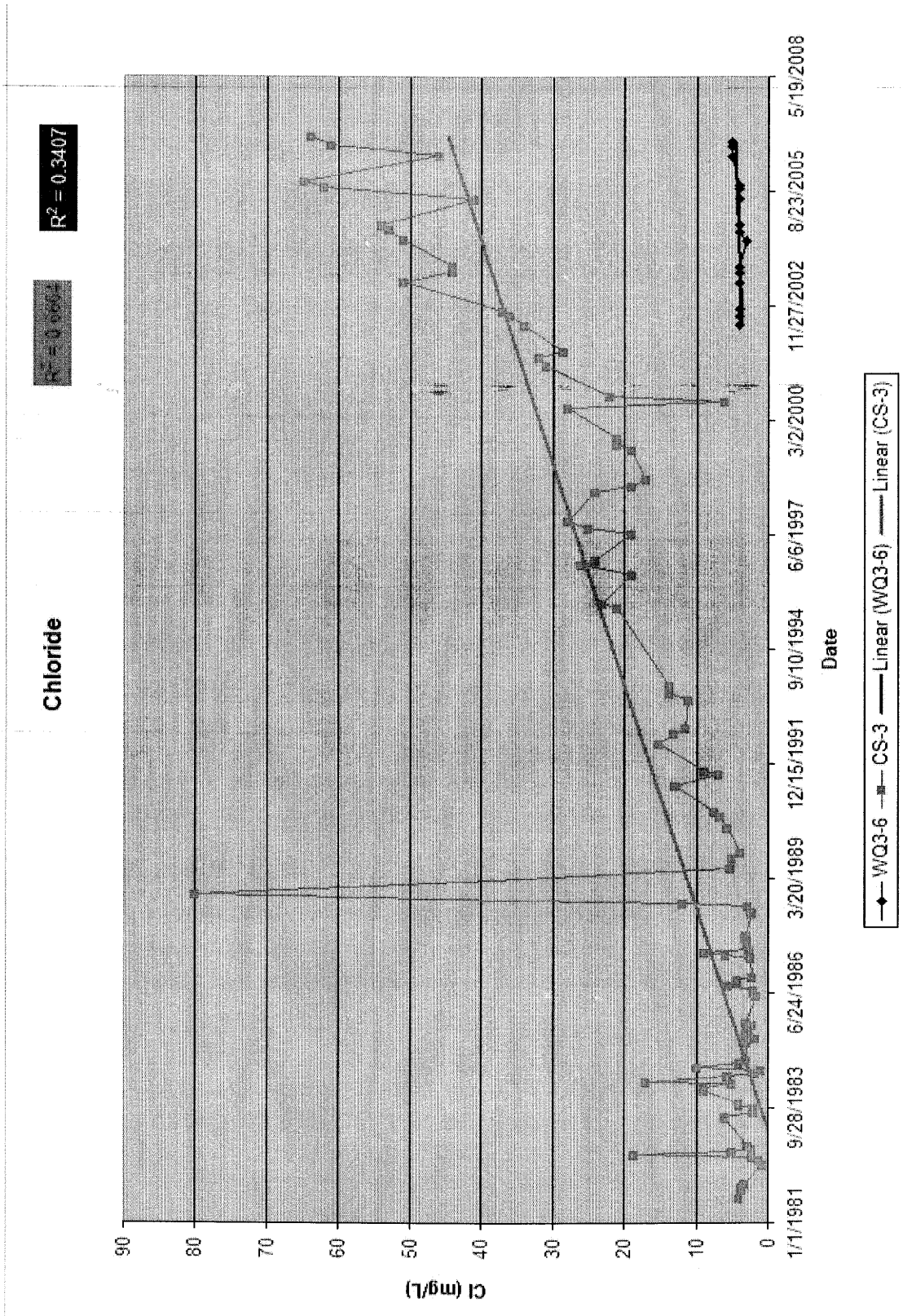
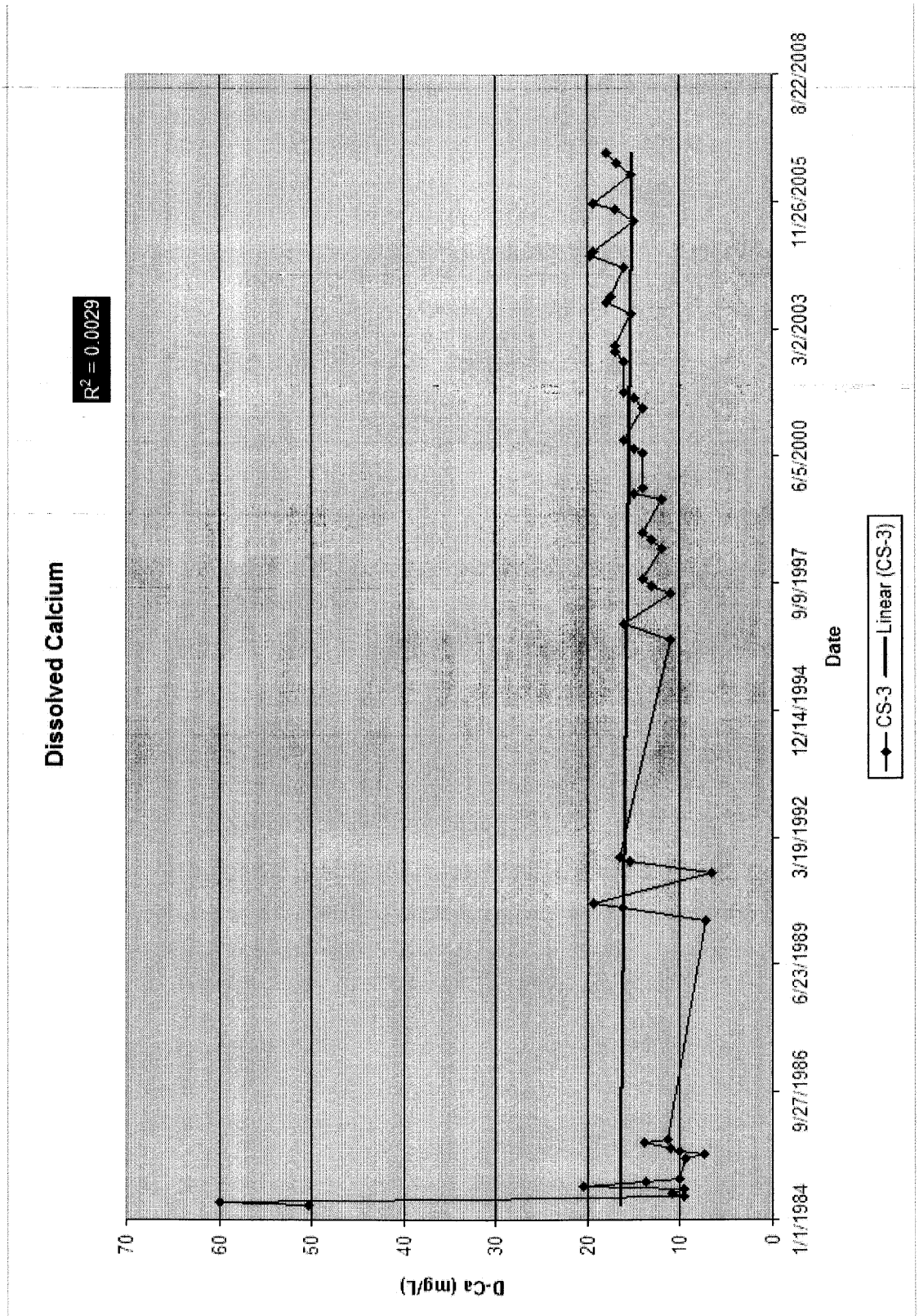
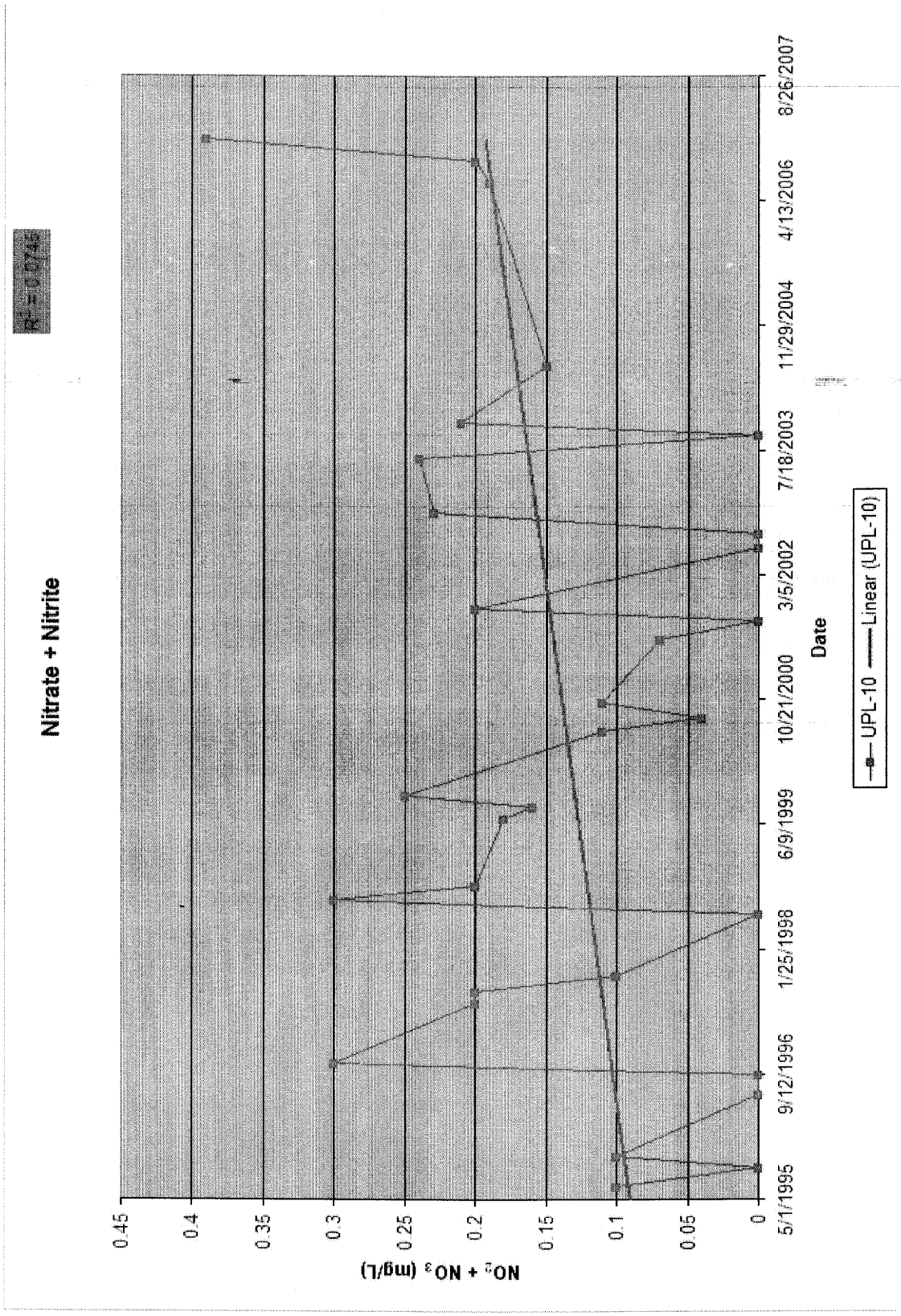
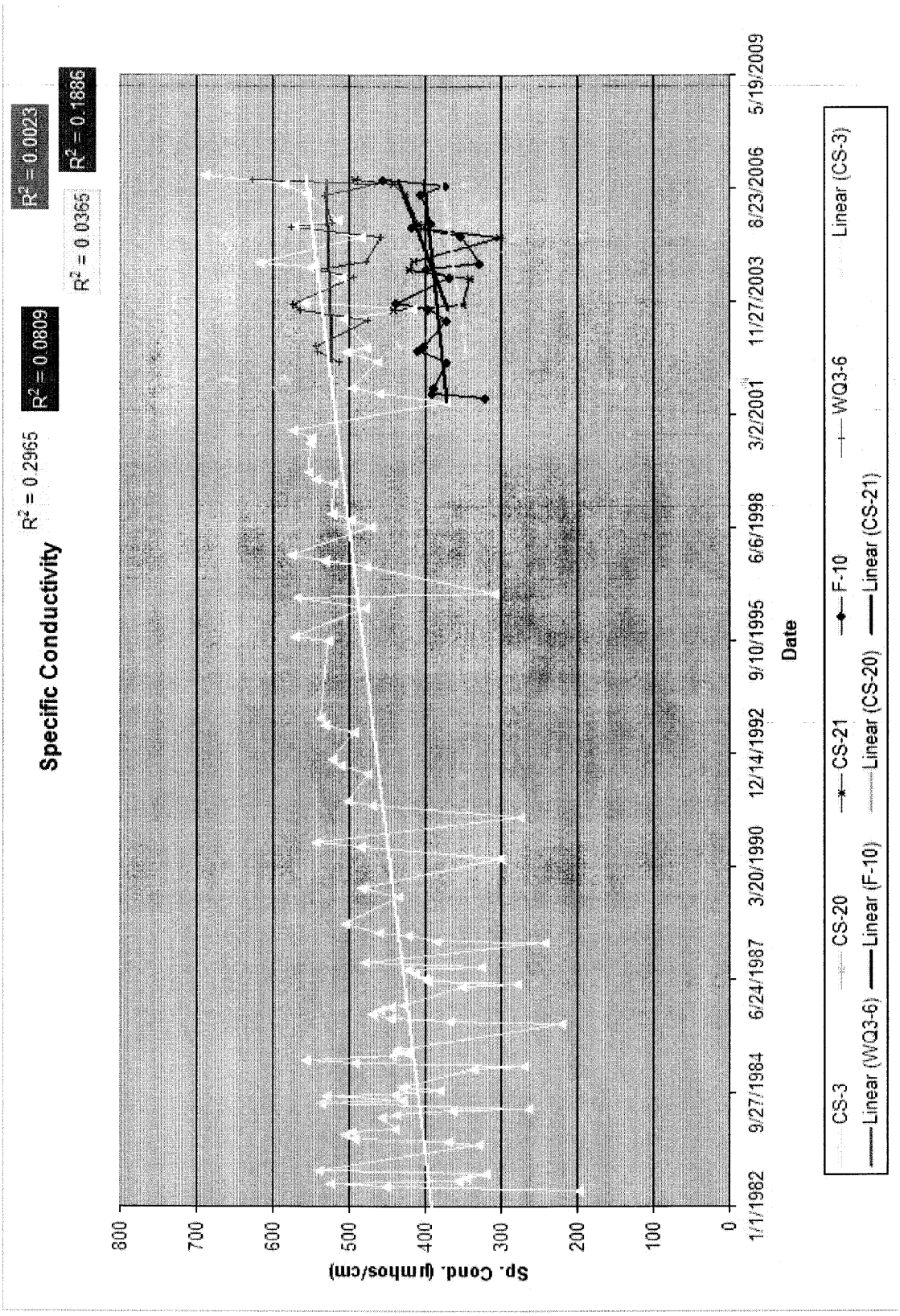
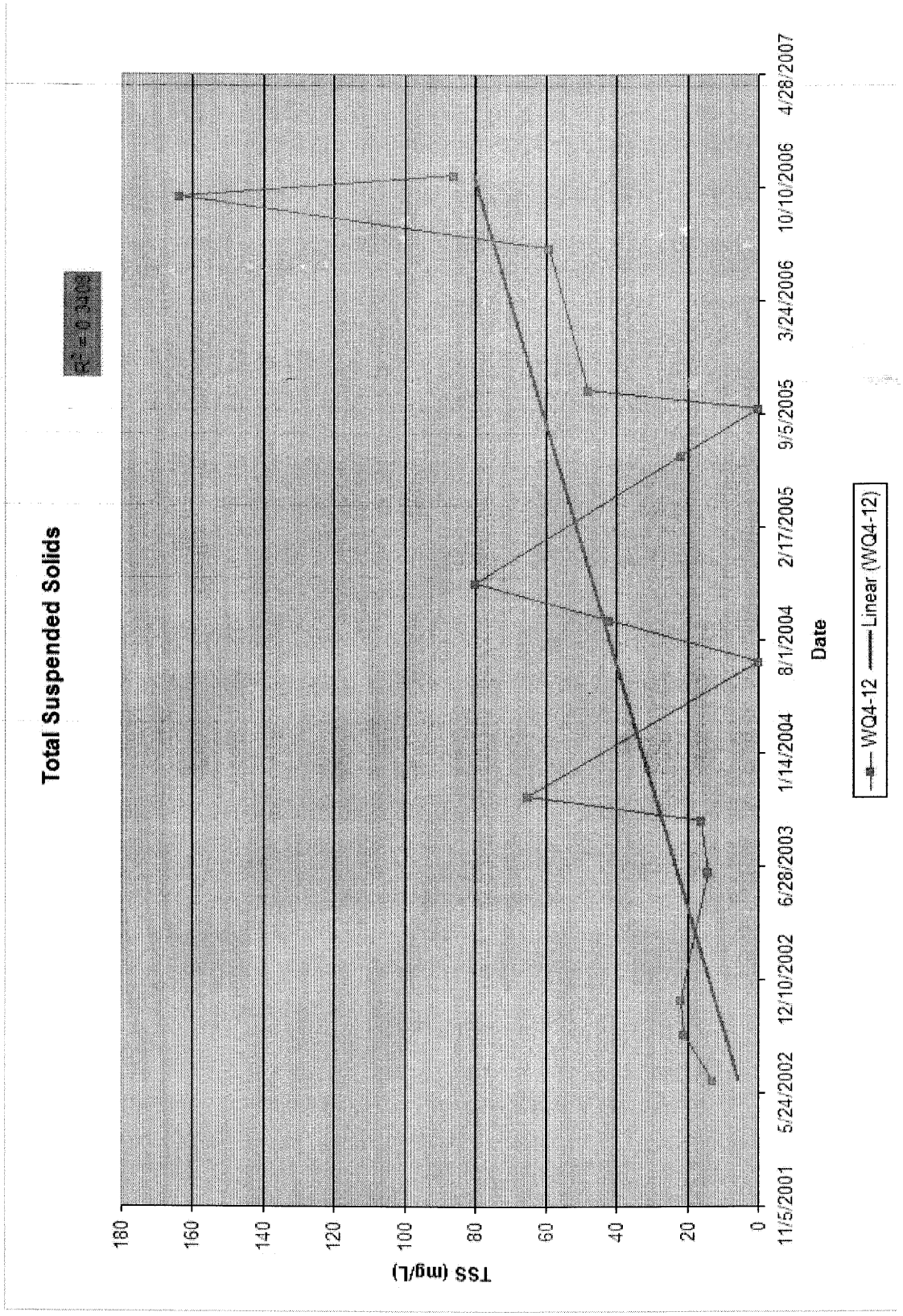

Chloride
R² = 0.9664
R² = 0.3407
Cl (mg/L)
0
10
20
30
40
50
60
70
80
90
1/1/1981
9/28/1983
6/24/1986
3/20/1989
12/15/1991
9/10/1994
6/6/1997
3/2/2000
11/27/2002
8/23/2005
5/19/2008
Date
WQ3-6
CS-3
Linear (WQ3-6)
Linear (CS-3)


Dissolved Calcium
R^2 = 0.0029
D-Ca (mg/L)
70
60
50
40
30
20
10
0
1/1/1984
9/27/1986
6/23/1989
3/19/1992
12/14/1994
9/9/1997
6/5/2000
3/2/2003
11/26/2005
8/22/2008
Date
CS-3
Linear (CS-3)


Nitrate + Nitrite
R² = 0.0745
NO2 + NO3 (mg/L)
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
5/1/1995
9/12/1996
1/25/1998
6/9/1999
10/21/2000
3/5/2002
7/18/2003
11/29/2004
4/13/2006
8/26/2007
Date
UPL-10
Linear (UPL-10)


Specific Conductivity
R² = 0.2965
R² = 0.0809
R² = 0.0365
R² = 0.0023
R² = 0.1886
Sp. Cond. (µmhos/cm)
800
700
600
500
400
300
200
100
0
1/1/1982
9/27/1984
6/24/1987
3/20/1990
12/14/1992
9/10/1995
6/6/1998
3/2/2001
11/27/2003
8/23/2006
5/19/2009
Date
CS-3
CS-20
CS-21
F-10
WQ3-6
Linear (CS-3)
Linear (WQ3-6)
Linear (F-10)
Linear (CS-20)
Linear (CS-21)


Total Suspended Solids
R² = 0.3402
TSS (mg/L)
180
160
140
120
100
80
60
40
20
0
11/5/2001
5/24/2002
12/10/2002
6/28/2003
1/14/2004
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
Date
WQ4-12
Linear (WQ4-12)